Appendix A—Planning Influences

This summary presents the factors affecting land use and development in the Flagstaff region. The factors include regional influences, physical environment, open lands, land use patterns, public facilities and services, transportation, and demographic and economic trends and projections.

Regional Influences

Gateway to National Parks and Monuments and Public Lands

Flagstaff serves as the primary gateway community to Grand Canyon National Park, Sunset Crater Volcano National Monument, Walnut Canyon National Monument, Wupatki National Monument, San Francisco Peaks, Snow Bowl Ski Resort, ponderosa pine forest, and national forest lands.

Significant Growth in Arizona

The population growth in the state, and particularly in the Metro-Phoenix area, has continued at a significant rate. At the same time, the number of visitors to the Flagstaff region with its cooler temperatures, beautiful scenery, and recreational opportunities has also increased. Increased visitation to the area has affected the region's transportation system, open spaces and recreational areas, and national parks and monuments.

Transportation Hub

Flagstaff serves as the major transportation hub for northern Arizona with Interstate 40 (I-40) running east-west through the city and region and Interstate 17 (I-17) running south toward the Metro-Phoenix area. Consequently, traffic congestion, particularly along I-17, will continue to increase as the region and the state grow. The city's location at the intersection of I-40 and I-17 has attracted significant business, commercial, and residential development.

Open Lands

Public Multiple Use Lands

Flagstaff is surrounded by land under public jurisdiction as illustrated on the Ownership Patterns Map. Nearly 75 percent of land in the Metropolitan Planning Organization (MPO) is under jurisdiction of the US Forest Service and National Park Service, 8 percent is under jurisdiction of the State Land Department, and approximately 3.5 percent is under the jurisdiction of the Navajo Army Depot. These lands are managed for a multitude of public recreational and economic uses. The vast majority of these lands at the further reaches of the MPO boundary should remain intact as open lands .

Some areas of US Forest Service land close to the city that are identified as low priority for open space retention may be subject to development pressure as a result of land exchanges, but these areas do not constitute a significant portion of federal lands within the MPO. Of greater significance are the State Trust lands surrounding the city. There are more than 25,000 acres of State Trust land within the MPO boundary, including more than 6,500 acres (10 square miles) within the city limits. These lands are subject to sale at public auction for development or other purposes. The timing of such action would likely be dependent on market pressures, which will be influenced by the land use pattern established over the next 10–20 years, as well as the amount of private land available for development.

Open Space

In 1997, a Memorandum of Understanding (MOU) was prepared in which the City of Flagstaff, Coconino County, the US Forest Service, the National Parks Service, Arizona Game and Fish Department, and the Arizona State Land Department agreed to commit to using the *Flagstaff Open Spaces and Greenways Plan* in their future planning and land management.

Prior to the development of the the *Flagstaff Open Spaces and Greenways Plan*, the City of Flagstaff initially established an Open Space Green Belt (OSGB) surrounding the city in the city's *Growth Management Guide 2000*. The area includes significant hillsides within the city such as Observatory Mesa, McMillan Mesa, the base of Mt. Elden, and other foothills to the north. Drainageways such as the Rio de Flag, Bow and Arrow Wash, Sinclair Wash, and Switzer Canyon are also included and are also within, at a minimum, the 100-year flood plain.

The designated OSGB area is approximately 31,690 acres. The majority of this area, comprising 21,935 acres, is currently managed by the US Forest Service. Most of this land was designated high priority for retention as open space through the *Open Spaces and Greenways Plan*. Currently, 637 acres of Forest Service land surrounding the airport has a low retention priority.

State Trust land within the OSGB consists of 4,159 acres, 680 of which are designated with a low retention priority. The City of Flagstaff, in conjunction with others, is currently trying to implement strategies for raising funds that will eventually be used to purchase or lease the State Trust lands for conservation purposes, with special attention being paid to high retention areas.

As previously mentioned, the majority of land within the Flagstaff MPO, outside of the city limits and the OSGB, is public land as well. The *Flagstaff Open Spaces and Greenways Plan* has identified most of this land as an area that should remain in its natural state as open space. The plan has recommended that the Forest Service actively pursue maintaining more public lands for recreational, cultural, and other compatible uses, rather than divesting itself of lands in the urban interface where traditional agricultural uses may no longer be feasible. It recommends that efforts be made to retain State Trust lands for open space activities as well. The plan has been adopted by the City of Flagstaff and Coconino County and should play a key role in the region-wide growth management process.

Physical Influences

The Flagstaff area possesses diverse soil and geologic patterns, significant variations in slope and topography, a large contiguous ponderosa pine forest setting, and an extensive system of natural drainageways. Such areas can provide unique scenic settings, valuable resources for wildlife, and many recreational opportunities. These areas are also subject to natural processes and forces.

Because of these natural forces, such areas can become hazards and thus a threat to life and property if not developed properly.

Floodplain

Flagstaff has many acres of otherwise developable land impacted by potential flooding. The 100-year floodplain, shown on the Physical Influences Map, indicates that a large portion of the floodplain is developed, and consequently there exists the potential for catastrophic flooding. The heavily developed areas include the Downtown, Southside, Sunnyside, Northern Arizona University and Continential areas . These areas have experienced considerable damage from many historical flood events, which saw these areas under water for extended periods of time. Flooding potential increases development costs since new construction must be either floodproofed or raised above the level of the 100-year flood elevation.

The Rio De Flag Flood Control Project, which is currently under study, proposes to realign and restore the Rio de Flag's channel to its historic outfall through Flagstaff in order to minimize potential flood damages. This project will create new opportunities for infill and redevelopment in areas that are currently restricted by floodplain limitations.

Within the unincorporated areas of the MPO flood prone areas include the Rio de Flag in the Fort Valley and Doney Park areas. These areas have experienced many historical flood events, which saw these areas under water for extended periods of time. Flooding potential increases development costs since new construction must be either floodproofed or raised above the level of the 100-year flood elevation.

Soils

The geology of Coconino County has directly affected the formation of various soils due to the composition of bedrock materials, topography, geologic structures and the influence of topography on climatic patterns. Soils in the area vary widely in type and character, ranging in composition from course grained well-drained materials with no limitations for construction to fine-grained materials with high groundwater and substantial limitations for septic systems and building foundations. Highly permeable, cindery soils and fractured rocks generally allow precipitation to percolate to great depths. For this reason, there are no perennial streams in the area and runoff from the region is among the lowest in Arizona.

The areas with limitations are generally dispersed throughout the planning area. However, two areas generally show major limitations. These include the Fort Valley area, with shallow groundwater, and the Bellemont area, with fine-grained soils with slow percolation rates and some shrink-swell potential.

Topography

The planning area is characterized by gentle to steep forest slopes in an area shaped by volcanic activity and canyon formation. Evidence of volcanic activity can be seen from the Kachina Peaks Wilderness area, which is a remnant of a volcano that once blew out, as well as the Sunset Crater volcano, the Dry Lake caldera, and many of the cinder cones throughout the region. The San Francisco Peaks mass, which is comprised of four peaks, all rise to elevations of more than 11,000 feet. Immediately north of the city lies Mount Elden, which rises to an elevation of over 9,000 feet.

Several deep canyons incise the broad plateau, including Walnut Canyon. Walnut Canyon is 400 feet deep and has an intermittent east-northeast flow. It contains a wide range of vegetation zones, including riparian, semi-arid, and conifer species.

The major natural water and drainage feature in the area is the Rio de Flag, a tributary of the San Francisco Wash, which flows into the Little Colorado River. Originating from the San Francisco Peaks, it flows intermittently through the wide, flat valleys of the Fort Valley region, the steep, narrow canyons north of Flagstaff, and the relatively wide, flat-bottomed canyons southeast of the city. Residential, commercial,and industrial development is extensive along the floodplain of the Rio de Flag through most of the city.

Several intermittent stream drainages exist throughout the planning area. Lake Mary is an artificial lake formed from two dams to serve as a water reservoir for the area. Marshall Lake is a natural shallow lake filled with water year-round in average years. A few “dry” lakes, such as Rogers Lake and Dry Lake, exist, which when provided with precipitation, form wetlands or marshes.

The majority of areas with steep slopes (>25%) are located in public lands, including the Coconino National Forest (see Property Ownership Map). Generally, only small pockets of steep slopes exist on private lands within the planning area. Steep slopes are generally less stable for development, are susceptible to erosion, and may require excessive cut and fill that can have profound visual impacts on the character of an area.

Geology

Flagstaff and the surrounding area are underlain by a complex series of volcanic and sedimentary rocks. These rock formations are formed locally and regionally by a series of folds, faults, and joint fractures that collectively represent the geologic structure of the area. The volcanic rocks that cover the area are from eruptions which began during the Pliocene time and continued into Recent time (within the last 900 years). Basaltic volcanic rocks form the surface of most of the plateau and the San Francisco Peaks, while selicic rocks form Elden, Morman, O’Leary, and Kendrick mountains. These cinder deposits are highly permeable and represent a good recharge source to the underlying aquifers. The rock sequence that underlies the volcanic formations comprises a series of consolidated sedimentary formations laid down prior to tectonic disturbance and subsequent volcanic activity.

Historically, both surface water and groundwater reservoirs have served as sources of water supply in the Flagstaff area. The principal surface water elements in the planning area are Sinclair Wash, Rio de Flag, Walnut Creek, Upper and Lower Lakes Mary, and the Inner Basin springs. Both Sinclair Wash and the Rio de Flag are ephemeral with flows occurring only in direct response to precipitation.

Groundwater occurs locally in shallow aquifers which serve only as transient storage as groundwater percolates downward to the deeper aquifers. Many of the volcanic rocks are interbedded with weathered residual soils, which commonly have low vertical permeability. Unless extensively fractured, these volcanic rocks retard the downward movement of water to the underlying aquifers.

In general, groundwater levels in the region occur at depths of more than 2,000 feet. Within the city limits, the groundwater table ranges from an elevation of less than 6,000 feet in the southwest to about 5,200 feet in the northeast. In the vicinity of Lake Mary, a major groundwater mound occurs from which groundwater moves away in all directions. Within this area, groundwater occurs at depths of 300 to 500 feet. In some areas near Flagstaff, groundwater is found close to the surface perched on impermeable volcanic material, very fine-grained sediments, or low permeability strata. These water-bearing zones supply many of the seeps and springs which were a significant resource in the early development of Flagstaff. Because of the availability of shallow water, these seeps and springs also support very diverse ecosystems in this semi-arid region.

Climate

Unlike the desert towns to the northeast and southwest, the Flagstaff area receives enough precipitation during an average year (20 inches in town to 35 inches in the Peaks) to support a significant amounts of vegetation. From early July until early September afternoon thunderstorms develop almost daily. The area receives about 10 inches of precipitation during the winter, although amounts are quite variable from one year to the next. The most severe weather is associated with storms that enter the state from the west after picking up considerable moisture from the Pacific Ocean. Most of the area's winter precipitation falls as snow, which averages 86 inches. Extreme snowstorms are not unknown to the area, however.

Correlation beween regional precipitation patterns and the area's water supply indicate that (a) relatively high summer precipitation does not appreciably increase available water supply; however, it results in reduced peak water demand; and (b) winter precipitation, either as rainfall or snow, increases the annual springtime surface water yield of the Lake Mary reservoir and the Inner Basin springs.

Seismic Conditions

An earthquake hazard evaluation was completed for the Flagstaff area in 1997 for the Arizona Division of Emergency Management, Earthquake Program. The evaluation was conducted for this area based upon its relatively large and rapidly expanding population, proximity to seismic sources,and damaging historical earthquakes. The risk of ground shaking in the Flagstaff area is considered moderate. However, the overall seismic risk to the Flagstaff community is increased by the growing population and presence of unreinforced masonry buildings.

Flagstaff is subject to ground shaking from earthquakes originating in the Northern Arizona Seismic Hazard Belt (NASB). Historically, earthquakes originating in this belt have resulted in ground shaking and damage to the Flagstaff region in 1906, 1910, and 1912, all now believed to have occurred within 24 miles of Flagstaff.

The northwest trending Catarak Creek fault systems underlies the Flagstaff region and appears to be controlling much of the area's seismicity. The Lake Mary fault graben, located just south of Flagstaff, is one of the longest segments of this system.

Arizona is designated by the Federal Emergency Management Agency National Earthquake Hazards Reduction Program as a "high risk" state for earthquakes.

Wildfire

In the Flagstaff area, fire is a natural and frequent occurrence. Under proper conditions, these fires may provide certain benefits to the ecosystem. Ponderosa pine trees, our predominant forest type, are well adapted and fire-dependent to low intensity fires. Because the Plan area is "desert forest," pine needles and branches do not decay like they do in wetter, more humid climates. Fire is a major nutrient cycling agent of the Southwest and was frequent prior to European settlement.

Today, our forests are vulnerable to extreme and more devastating fire occurrences than ever before due to the amount of accumulated fuel—both live and dead. Fires, once predominately confined to the ground fuels (grasses, shrubs, lower tree limbs) burned with relatively low temperatures. They now commonly burn hotter and involve entire trees, resulting in more extreme fire behavior and devastation.

The ignition source for fires may result naturally from lightning strikes or may be human-caused. The greater Flagstaff area averages roughly 600 ignitions per year, split fairly evenly between lightning and human-caused.

Three factors influence the spread of wildfire: fuel, weather, and topography. Flagstaff lies in the largest contiguous ponderosa pine forest in the world. A major factor influencing the susceptibility of natural vegetation to wildfire is the ratio of dead and decayed matter to living, and the burn cycles of many of the timber stands in the Flagstaff area have been so suppressed that the fuel loads are excessive. Natural fuel amounts have increased dramatically in the past 80 years due in part to past logging practices, grazing, and fire suppression efforts. Local fire spread pattern is from the southwest to the northeast due to the prevailing wind pattern. Fires burn faster upslope than down. Canyons, ridges, saddles, and drainages funnel wind. South facing slopes dry quicker and burn easily.

The "Wildland/Urban Interface" is a term describing the geographical area where development meets forested or heavily vegetated areas. The City of Flagstaff is surrounded by wildlands that threaten the community with a wildland fire. Property and lives within entire neighborhoods, historic landmarks, and commercial centers are at risk.

Heavy use of wildlands, intermixed development, and weather conditions contribute to the potential for wildfire. The existing relative hazard can be expected to increase as additional structures are constructed in areas with characteristics favorable to wildfire spread.

While topography is a major issue for wildfire spread, ridgetop properties with desirable views continue to command a premium price for rural residential development.

The development of areas with high fuel risks presents other conflicts in addition to the increased dangers to personal and property damage. Many vegetative communities that are dependent upon repeated fire occurrence for maintenance are critical wildlife habitat areas. The modification of such areas by the placement of structures, roads, and fuel breaks may substantially reduce the amount of browse and cover that are available to shelter and support wildlife species, and may cause visual and aesthetic changes to the landscape that form an important part of Flagstaff's character.

Programs, such as hazard mapping, the Forest Stewardship Program, and the re-introduction of fire through prescribed fire programs, all help to reduce the hazard.

Air Quality

The greater Flagstaff area enjoys excellent air quality, considering it one of its most important assets. Not only is it important for public health but also to protect scenic views. Under the federal Clean Air Act, the U. S. Environmental Protection Agency has the responsibility for setting and enforcing air quality standards. Much of the local enforcement is delegated to the Arizona Department of Environmental Quality. Occasionally, there are suspended particulate problems caused by natural wind-blown fugitive dust and also from unpaved roads, disturbed vacant lots, construction activity, woodstove and fireplace smoke, Forest Service controlled burns, diesel-fueled vehicles, and off-road vehicles.

Light Quality

Northern Arizona has long been recognized by its residents and the astronomical research community for its clear, dark nighttime skies. Two major observatories and two smaller ones are presently located in the Flagstaff area, with a large telescope project having recently been constructed. To allow for the continued pursuit of astronomical research and the enjoyment of the nighttime visual environment, the detrimental effects of light pollution should be minimized while conserving energy and resources.

Land Use Patterns

Existing Land Use

In developing a general concept for future land use in the Flagstaff MPO, it is essential that existing land uses be inventoried and that current development patterns be evaluated. The uses of land within the area did not just happen, but evolved in a natural way that supported the livelihood of the residents of the county.

The area's development patterns are dependent on several major factors:

Transportation Network

The existing highway and major road network has been a major determinant of land use and development patterns. Interstate 40, Interstate 17, US Highways89 and 89A, US Highway 180, and Historic Route 66 serve as the major traffic corridors in the Flagstaff area with nearly all residents of the unincorporated area finding it necessary to travel these routes to Flagstaff or other parts of the community. With few exceptions, all rural residential developments feed collectors or local roads that intersect one of these routes. The resulting traffic volumes, coupled with commuter traffic and through-traffic, have made these roads an attractive location for commercial and industrial activities.

Geography

The ownership patterns of private and public lands and topography have also played a major role in determining the development patterns. Residential development which years ago was mostly in Flagstaff or other small communities now tends to be spreading across the rural landscape because of the desirability of these rural forest locations.

Utilities

The absence of public water or sewer service in rural sections of the planning area, together with some soil and topographic restrictions, serve as development constraints. These constraints should influence land use and development patterns significantly. Generally, the lack of water in rural areas has severely constrained development in the past. However, in more recent years, water availability has not been as strong a deterrent to residential development. Hauling water has been accepted as a part of the rural lifestyle that is drawing residential development outside the Flagstaff city limits. Some of the areas that were developed in the past on marginal soils or in areas with shallow groundwater, and which have individual utility systems, have experienced well contamination and septic system failures.

The Existing Land Use Map illustrates the location and distribution of generalized existing land uses within the planning area. Table 2 delineates the existing acreage for each land use category described on this Map. Educational uses, public buildings and grounds, and other public facilities are shown as Institutional Uses in these tables and map. Of the approximately 48,375 acres of private land in the MPO, approximately 16,665 acres, or 34.4 percent of the MPO, remain vacant.

Table 2. Existing Private Land Use and Acreage

Land Use Category (Private Lands)	*Total MPO (Acres)*	*Percent of Private Land (MPO)*	*City of Flagstaff (Acres)*	*Percent of Private Land (City)*	*County MPO (Acres)*	*Percent of Private Land (County)*
Very Low Density Residential	17880.0	37.0%	376.3	2.0%	17503.7	58.4%
Low Density Residential	2373.3	4.9%	2345.1	12.7%	28.1	0.1%
Medium Density Residential	482.2	1.0%	293.0	1.6%	189.1	0.6%
High Density Residential	400.1	0.8%	400.1	2.2%	0	0.0%
Commercial General	816.7	1.7%	705.5	3.8%	111.3	0.4%
Commercial Medical	10.3	0.02%	9.3	0.1%	1.0	0.0%
Commercial Neighborhood	28.2	0.06%	24.4	0.1%	3.8	0.01%
Commercial Office	38.6	0.08%	27.8	0.2%	10.8	0.04%
Industrial	1891.0	3.9%	1147.3	6.2%	743.7	2.5%
Institutional	3596.5	7.4%	2657.6	14.4%	938.8	3.1%
Parks	1357.5	2.8%	982.5	5.3%	375.0	1.3%
Open Space	512.3	1.1%	354.7	1.9%	157.6	0.5%
Right of Way	2342.0	4.8%	2324.0	12.6%	0	0.0%
Undeveloped	16664.6	34.4%	6763.2	36.7%	9901.4	33.0%
Total Private Lands	*48375.2*	*100.0%*	*18411.9*	*100.0%*	*29964.2*	*100.0%*

The generalized existing land use pattern within the unincorporated area is predominated by very low-density residential land uses, which make up approximately 58 percent of private land in the county. Commercial uses in the county are located along major arterials and industrial uses are clustered around interstate highway access points. Vacant and agricultural land is predominately being held or utilized in reserve for future development. The unincorporated area consists of varying sized parcels of urbanized and unimproved lands dispersed throughout the developable area. The unusual configuration in the unincorporated area is due in large part to decades of unregulated land divisions, exempt divisions of land, and the distribution of public lands.

A similar pattern exists in the City of Flagstaff where commercial development follows Route 66 and Milton Road and in downtown concentrations. Industrial uses are clustered around Interstate 40 highway access points and areas adjacent to Route 66 and the Santa Fe Railroad. Large shares of lands located within the city limits are public lands, including both state and federal lands. Residential uses are generally concentrated around the central business district, east and west of Buffalo Park, and both north and south of Interstate 40. Low and very low density single family homes and subdivisions make up the majority of housing types in the city, although medium and high density housing have made up a higher percentage of housing over the past ten years. The current and ten-year trends in housing within the city is illustrated on Table 3, Trends in Housing Types.

Table 3. Trends in Housing Types

Category	*Density Range*	*Percentage of Existing Housing by Type*	*Percentage of Housing Developed Past 10 Years by Type*
Single family (low and very low density)	Up to 5 du/ac	54%	34%
Medium density	6–12 du/ac	19%	22%
High density	> 12 du/ac	27%	44%

Ownership Patterns

Land ownership within the Flagstaff MPO is dominated by public holdings—greater than 85% (see Ownership Patterns Map), and 72% of the public holdings lie within the Coconino National Forest. Generally, the privately owned lands are located along and adjacent to the major state and US highways crisscrossing the area. Table 4, Land Ownership, provides a detailed breakdown of the land ownership within the Flagstaff MPO.

Table 4. Land Ownership

Owner	*Acres*	*Percent*
Public Multiple Use Lands		
Coconino National Forest Lands	243,005	72.24
State Trust Lands	25,627	7.62
Navajo Army Depot Lands	12,017	3.57
Walnut Canyon National Monument	3,228	.96
Sunset Crater National Monument	3,048	.91
County Land	374	.11
Other	705	.21
Total Public Lands	*288,004*	*85.62*
Total Private Lands	*48,375*	*14.38*
Total MPO	*336,379*	*100.00*

Demographic and Economic Trends and Projections

Population

Population Distribution

Based on information provided by the Arizona Department of Economic Security (DES) and Coconino County, it is estimated that the Flagstaff MPO had a population of 70,591 in 1997. This represents an estimate of 58,145 for the City of Flagstaff and 12,446 for the portions of unincorporated Coconino County within the MPO boundary. From 1985 until 1995, the region grew at a rate of nearly 2.5% per year, which was slightly less the state's growth rate of 3.1% during the same period.

The City of Flagstaff accounts for approximately 82% of the Flagstaff MPO population. Other significant areas of population include the Black Bill/Doney Park, Kachina Village/Mountainaire, and Timberline/Fernwood areas. The population distribution within the planning area may be inferred from the existing land use pattern that appears on the Ownership Patterns Map.

Generally, there has been a slight increase in the percentage of the Flagstaff MPO population residing within the City of Flagstaff, as opposed to the unincorporated areas, during the last 15 years. The need for municipal services, particularly water and sewer, may be partially responsible for this trend.

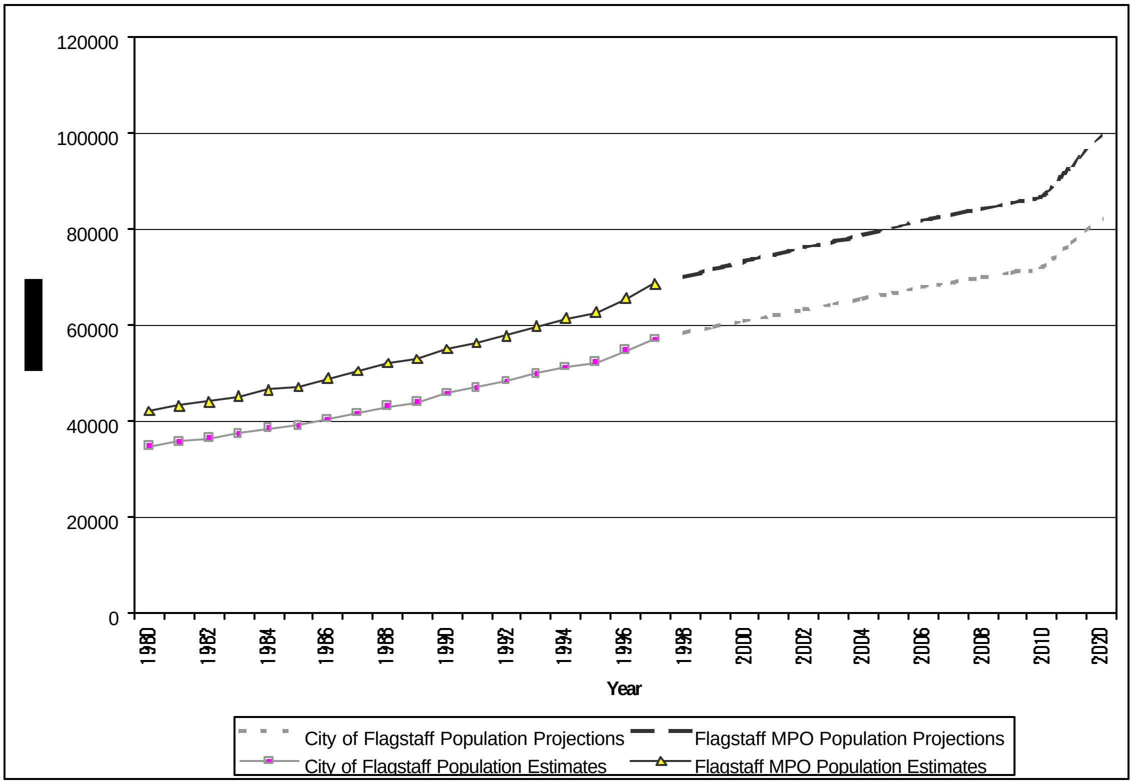
Population Characteristics

While the Flagstaff area population continues to be younger as a whole than Arizona and US averages, the population is aging. The fastest growing segments of the population between 1980 and 1995 were in the age categories of 25–44, 45–64, and 65+. These populations grew 70%, 78%, and 178%, respectively, while the city population grew 50%. The population in the age category of 45–64 grew 46%, and the 65+age category grew by 57% during the period 1990-1995, while the population of Flagstaff grew only 13%. The population under age 18 actually decreased as a percentage of overall population during the period 1980–1995, but during the period 1990–1995 has increased faster than the overall rate of growth (19%). Although there have been increases in this segment of the population in recent years, the average household size continues to decrease from 3.35 person per household in 1970 to 2.68 persons per household in the city in 1995 and 2.05 in the county in 1990, according to census data.

Population Projections

Figure 2 traces population change in the Flagstaff MPO and City of Flagstaff since 1980 and illustrates the Arizona Department of Economic Security population projections through the year 2020. Population in the MPO is projected to increase by 33,152 persons by the year 2020, of which 25,432 are forecast for the city and 7,720 for the county. This represents annual growth rates of 1.59% for the city and 2.22% for the county. In all, the total projected population for the region is 103,743, of which 83,577 is for the city and 20,166 is for the county.

Figure 2. Flagstaff Area Population Estimates and Projections



Economy

Increasing Employment

The US Census and Bureau of Economic Analysis records show that employment (the average number of employed residents) increased from 16,227 in 1980 to 27,339 in 1995 within the City of Flagstaff, approximately a 3.8% annual rate of growth. During the same period, the unemployment rate has dropped from 8.4% to 6.2%. Major employment sectors are government, retail trade, and services. The service and retail trade sectors have shown the greatest increase in employment since 1990. Preliminary data suggest that employment will reach about 32,900 in 2000, continuing the roughly 4% per year increase.

Expanding Income

The increase in employment has been shadowed by increases in earned wages, although the increase in wages, as can be seen from Figure 3, is less than statewide increases in earned wages. Wages rose 18% in the Flagstaff area from 1990-1996 but lost ground with respect to Arizona wages, which rose 22%. Flagstaff area average earned wages per job were $21,236 in 1996. However, while earnings fell further behind, the data show that total personal income received by area residents has been growing more quickly than statewide total personal income since 1981. Personal income at $16,733 is still well below the statewide average (83% of the statewide average in 1995). Employment and total personal income (3.8% and 8.0%, respectively) have both grown more rapidly than the county's population, which increased at a rate of about 2.57% per year since 1980.

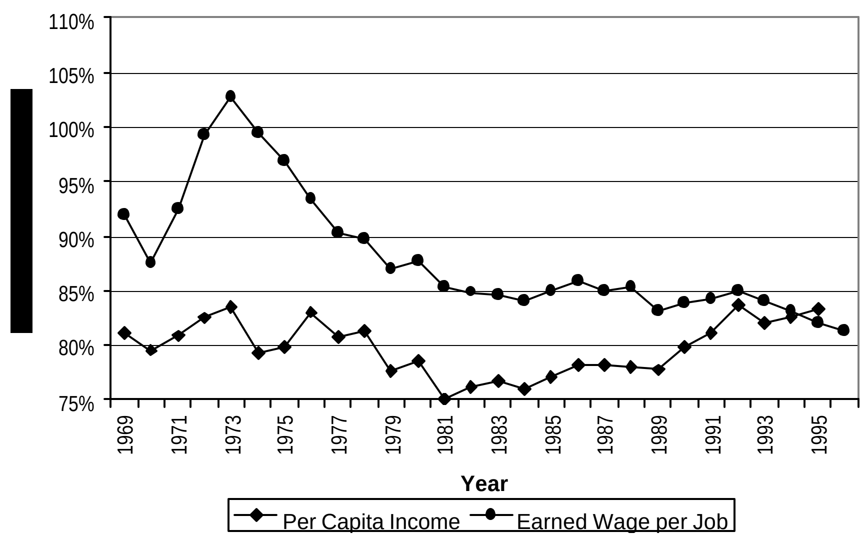


Figure 3. Wages and Personal Income, Flagstaff vs. State of Arizona

Economic Dependence

The Flagstaff area economy is dominated by three sectors including services, retail trade, and government that make up over 70% of the area's employment. The retail trade and services sectors have shown the greatest increase during the last 10 years, growing over 5,000 jobs. The lower wages in this sector may be responsible for the more recent declines in local area earned wages when compared to statewide wages (Figure 3, above). These three sectors also exceed the national average with respect to employment percentages, which reflects the significance of Northern Arizona University and tourism to the local economy.

Housing

Housing Trends

New home and multifamily construction increased during the period 1990–1995 by an average annual rate of 1%. However, 1992 and 1994 actually saw slight decreases in construction from the previous years due to reductions in the construction of multifamily units. Single family home construction remained generally steady through the period. When including manufactured homes, more single family homes were constructed or placed in the unincorporated area than in the City of Flagstaff during the period.

Public Facilities and Services

Water and Wastewater

Water and wastewater utility service in the Flagstaff MPO is provided by a number of private and public entities, sometimes by individuals or individual developments.

Flagstaff Water Facilities

The City of Flagstaff water facilities provide domestic water in the City of Flagstaff.

Anticipated Water Demand (2020)

The average demand per capita was 128.24 gallons in 1997. Assuming continued expansion of the water conservation program and reclaimed water system, 125 gallons per capita per day (gpcd) would seem to be a conservative estimate by the year 2020. The 1997 peak day usage to average day usage ratio (218/128) is being used to establish the 2020 peak day.

Using these numbers, potable water usage would project:

84,000 (2020 population) X 125 gallons/day = *10.5 million gallon average day*
10.5 million gallon average day X 218/128 = *17.8 million gallon peak day*

Water Production Capacity

The city's water production capacity can vary with the climate. The following displays the best case and the worst case. Numerous combinations exist between these two cases.

Best Case—Wet Year	
Surface Water	
Lake Mary	7.0 mgd
Inner Basin	2.5 mgd
Well Water	
Lake Mary Wellfield	5.3 mgd
Woody Mt. Wellfield	6.1 mgd
Local Wells	1.0 mgd
Total Wet Year	21.9 mgd

Worst Case—Dry Year	
Surface Water	0.0mgd
Well Water	
Lake Mary Wellfield	5.3 mgd
Woody Mt. Wellfield	6.1 mgd
Local Wells	1.0 mgd
Adjustment for one well down for repair	- 0.7 mgd
Total Dry Year	11.7 mgd

The Woody Mountain well field figures assume the equipping of the recently drilled Woody Mt. No. 11 Well. The figures for the local wells assume that the predicted quality and quantities of water will be available based on the preliminary tests of the wells. These amounts have not been proven over a period of extended pumping.

Each year, a review of the water supply operations includes a reserve of lake water to meet the peak demand in case of a drought. A drought of greater than 3 years would stress the supply.

Of the five sources of water supply for Flagstaff, groundwater from the Coconino and Supai Aquifers is the most dependable, while surface water is the least dependable. Surface water, in Upper Lake Mary, comes from a 55-square-mile watershed on US Forest Property. The amount of inflow into the lake each year depends on the temperatures and amount of snowpack received each winter. This varies significantly from year to year. Based on values published by the annual report, the 30-year median annual inflow to Upper Lake Mary is 1.9 billion gallons. The lake holds approximately 5 billion gallons and Flagstaff uses approximately 2.5 billion gallons per year. These figures show it will take much more than Lake Mary to satisfy Flagstaff's water needs. In addition to the limited amount, the inflow is sporadic due to variations in winter weather conditions.

The unreliability of annual inflow into Upper Lake Mary is readily apparent. The Inner Basin of the San Francisco Peaks has also been a source of water supply to Flagstaff for many years. This supply is also affected by changes in the winter snowpack and is limited to three diesel-powered wells and a few productive springs. This leaves groundwater as the potential source of water supply for Flagstaff's future.

How much groundwater is available and where is it best accessed are questions that have been asked for years. The Woody Mountain wellfield has provided water for Flagstaff since 1954. Today ten production wells exist (Woody Mountain No. 11 being one of them, which has not been equipped) with a production capacity of 6.1 million gallons per day. The Lake Mary wellfield has provided water to Flagstaff since 1962. Five production wells exist in the Lake Mary wellfield with a production capacity of 5.2 million gallons per day. Attempts to drill more wells in the area immediately adjacent to the Lake Mary wellfield have brought on fears from county residents of the city drawing down their wells by further wellfield development. The wellfield has been limited to an average of 2.4 million gallons a day on an annual basis since 1992 due to fears of over pumping the aquifer. Wells and data are being monitored to determine the actual wellfield yield.

In an effort to develop a long-range planning tool, the city entered into an agreement with the United States Geological Survey (USGS) in 1995 to take a close look at groundwater resources that may be available to Flagstaff. The work being done by the USGS is expected to take four years and will involve joint cost sharing between the two agencies. The city, which has the most to gain from the work, will be paying approximately $500,000 over the four year period while the USGS will be incurring approximately $170,000 of the project's cost.

Some of the most recently introduced high tech methods for groundwater evaluation are available to the USGS including satellite aerial photography, ground penetrating radar, square-array resistivity and borehole logging. Geochemical sampling and analysis is being conducted as a part of the project for determinations of age and routes of groundwater flow.

The amount of groundwater available under Flagstaff is known to be great. The problem for the city is determining where it can best be accessed. This is no easy chore when it is located approximately 2,000 feet underground. The results of the USGS work are anticipated to answer many of the questions that have been asked about Flagstaff's water supply for many years, such as how much is there, where is it, where is it coming from, and where is it going.

A long-term drought of greater that 3 years would threaten Flagstaff's water supply. A continual program to solve this concern includes (listed in highest probability of significance):

1. The search and funding for additional groundwater wells. The USGS information hopefully will locate sites for an additional 6 to 8 wells before 2020. Funding in the current Capital Improvement Plan (CIP) provides for two wells before 2010.
2. Expansion of the reclaimed water irrigation system and promoting high usage customers to use reclaimed water for nonpotable use.
3. Expansion and continued funding of the water conservation program.
4. Feasibility studies that are currently being conducted to assess the possibility of building pipelines from water sources such as Lake Powell and/or Clear Creek.
5. Water repurification. This has been proposed, but public perception would have to change before this would become feasible.

The city needs to continue to pursue additional water supplies to serve the current population during extreme droughts and to provide supplies for any future growth. In the last 40 years, there has been water available from the lake and the inner basin even during the driest years, but the probability does exist that these sources could dry up. Six additional wells could expand the well production to (12.4 + 4.2) = 16.6 mgd or close to the 17.8 mgd peak demand projected.

The city has had a water conservation program in place since the mid-1980s. Administered by a staff committee, programs such as the low-flow toilet rebates, public information, “on-hold” telephone recordings, public service announcements, home show booths, and elementary school puppet shows have been put into place. These types of programs are popular with the public and serve to instill a water conservation mind set, although their actual effect on water usage is not great.

The greatest effect on water usage is rates. In 1990 the city’s water rate schedule was restructured to use an inverted block rate structure whereby the more water the customer uses, the higher the rate is. This new rate structure along with the reclaimed water system have provided the city with the greatest water conservation impact.

Water Distribution System

Another significant feature of the city water system is its storage capacity. Total water storage capacity is 22.9 million gallons, broken down as follows:

- Zone A - 3.7 million gallons
- Zone B - 17 million gallons
- Kinlani Subdivision - .2 million gallons
- University Highlands - .5 million gallons
- Lake Mary Plant Clearwell - 1.5 million gallons

Zone A water is capable of being transferred by gravity to Zone B. This has proven to be a valuable characteristic of the system during periods of high water usage when low water levels are being experienced in the Christmas Tree Reservoir on the east side of town. This would indicate an advantage for sitting future storage in Zone A because of the flexibility it provides to the water system operators.

The condition of the water distribution system is poor in three areas of Flagstaff, the downtown area (both north and south side), Sunnyside, and the old O’Neil Springs line to Ft. Tuthill and the surrounding area. The condition is mainly due to old undersized water lines that are slowly being replaced under the utility’s capital improvement program. It will still take thirty or more years to replace all the old undersized lines at the current pace. The undersized lines do not pose a health and safety problem, and as new development occurs, the developers are being required to make necessary upgrades. Water lines that fall into the undersized category include those with diameters less than 6 inches.

Transmission mains are the major components of the distribution system. Recently completed in 1991, a 30-inch diameter pipeline was built from the Lake Mary Raw Water Pump Station through town to the intersection of Butler and Enterprise. From there, the transmission main reduces to 24-inch and 18-inch and continues to the Christmas Tree Reservoir located in the forest north of the Christmas Tree Subdivision. This project took five years to build and provides the capability of pumping water from the south of Flagstaff through town to the northeast part of the city. It should be noted that the location of major transmission lines is mostly limited to presently developed areas such as Woodlands Village and Route 66. A 16-inch transmission main does pass through the undeveloped parts of Sections 4 and 10 (Range 7E) and a 27-inch transmission main from the Lake Mary Water Treatment Plant runs through Section 22 and 27 (Range 7E).

If the local wells in Foxglenn and Continental provide a good quality and reliable water supply, these wells will reinforce the distribution system on the east side of Flagstaff. There is some hope that this could turn into a new wellfield for Flagstaff, which would add water supplies and change the hydraulics of the distribution system. Since the wells are very deep, they are expensive to construct and to operate. The two new wells are currently being equipped, and as the wells operate, data will be obtained on the validity of this exploratory wellfield.

Rural Water Systems

Areas outside the City of Flagstaff Urban Service Boundary are served by individual wells and small community systems including Bellemont Water Company, Kachina Village Improvement District, Ponderosa Utility Company, Forest Highlands Water Company, and Doney Park Water Company. While some areas in the county, like Fort Valley, can utilize wells as a source of water, most homeowners have to haul water since productive aquifers are very deep.

Flagstaff Wastewater Facilities

The City of Flagstaff wastewater system is made up of a wastewater treatment plant, a wastewater reclamation plant, and the wastewater collection system.

Anticipated Wastewater Generation (2020)

From the city’s 1997 Utilities Annual Report Update, sewage generation in 1997 data was at 100 gpcd, and this rate is expected to remain consistent in the future. Therefore, 2020 sewage generation would be:

84,000 (2020 population) X 100 gallons/day = *8.4 mgd*

Wastewater Treatment Capacity

The city has two facilities that will treat 10 million GPD of wastewater. The Wildcat Hill Wastewater Treatment Plant has a design capacity of 6 million GPD and the Rio de Flag Wastewater Reclamation Plant has a design capacity of 4 million GPD. The city should have adequate capacity to handle the flows to the year 2020 at the current usage projected. Additional solids treatment will be required. Funding is included in the CIP for expansion of the solids treatment in 2005, and additional treatment expansion in 2007–2009 because of the uncertainty of regulations and the increased demands that could be placed on the treatment processes.

Wastewater Collection System

The city's entire wastewater collection system operates by gravity flow. However, some facilities are too low to utilize gravity flow. Those facilities have been required to build and maintain their own pumping systems. Generally, the Urban Service Boundary, currently a component of the City's general plan, *Growth Management Guide 2000*, includes only those areas where the collection system can utilize gravity flow, although some sub-basins may require lift stations.

Bottlenecks in the city's sewer system that restrict growth have been identified over recent years and are gradually being upgraded. The completion of the Ellery/Ashhurst sewer project in 1996 opened up sewer capacity for development of properties in the drainage basin along Route 66 west of Milton Road. Construction of the Sinclair Wash sewer in 1995 by private development has provided adequate pipeline capacity for the full buildout of Woodlands Village. Private development is also planning to upgrade the Bow and Arrow phase 2 sewer that will allow buildout of the Ponderosa Trails development and the airpark.

Undersized collection mains still exist in the downtown area and Sunnyside even though the city has been trying to upgrade them on an annual basis. The utility's long range capital improvement program identifies sewer mains in these areas for replacement annually. But just as with the water lines, it will take many years to get the areas upgraded to present standards because the locations of Flagstaff's sewer interceptors, laterals, and collection lines are mainly in existing developed areas. Sections 4 and 27 (Range 7E) are exceptions.

Infiltration into the city sewer system has presented a problem in the form of sewer overflows during times of high precipitation when high flows exist in the Rio de Flag. Overflows have occurred in the Continental area along Country Club Drive, through the golf course, and in the Rio de Flag behind the East Side Flagstaff Athletic Club. Reasons for these overflows are leakage into the collection system, vandalism, and flat slopes in the sewer between Country Club and the Wildcat Hill Wastewater Plant. Much of the interceptor system has been replaced over recent years in an attempt to resolve the leakage problem, and sewer manholes have been raised above flood levels in the Country Club Drive area to prevent surface water from entering the collection system. The flat slope problem located in Section 8 (Range 8E) will eventually have to be resolved with the construction of a sewage pump station. The Rio de Flag Wastewater Treatment Plant has also provided an improvement to the city collection system by intercepting flow between the west side and east side of the city. This has taken a significant load off the east side collection system.

By far, the majority of the water and sewer line replacements identified in the city's capital improvement program are undersized lines in older subdivisions. Developers are required to provide upgrades to water and sewer lines that are impacted by their development, or wait for the city to modify its capital improvement program and set aside the necessary funding. The planning priority for the utility is to upgrade existing inadequate infrastructure and not to speculate on future growth areas. In most cases, the developers prefer to proceed with any necessary upgrades to avoid project delay.

With a few exceptions, all city utility customers are hooked up to the city sewer system. A few homes exist using on-site sewer disposal systems. On-site sewage disposal systems do not have a reputation of working well in the Flagstaff area because of the geological conditions, and new development within the city is required to tie into the city sewer system by making whatever extensions may be required.

Reclaimed Water Treatment and Distribution System Capacity

The 1990 Water and Sewer Bond program provided funding for the construction of a 4-mgd wastewater reclamation plant and reclaimed water distribution system on the west side of the city. The project was completed in 1993, and 1994 was the first full year of reclaimed water usage from the new facilities**.** The primary use of the reclaimed water has been irrigation in order to limit irrigation demands on the water distribution system. A number of major facilities are utilizing the system currently, including two golf courses, city parks, public schools, and Northern Arizona University. While the system has no industrial users at the present time, the quality of the reclaimed wastewater is adequate to permit use by many industries.

The reclaimed water system has been extended through Sunnyside, which will make reclaimed water available to Mt. Elden Middle School, Weitzel Elementary School, Ponderosa Park, Killip Elementary School, Bushmaster Park, and Thomas School. Reclaimed water will play a significant role in the city's future water resources. Currently there are approximately 3 mgd of reclaimed water that is not being utilized, and using it for irrigation could greatly help the city meet its peak summertime demand days. Reclaimed water line extensions are much less costly than drilling water wells and provide a comparable benefit.

The current capacity of the distribution system from the Wildcat Hill Wastewater Plant is limited to 1.6 million gallons per day. During peak demand days, operational changes to this system allow it to be pushed to 2 million gallons. Storage is being planned at the plant in CIP 2001, which will increase this capacity to 2 million gallons without making the operational changes. The distribution system would have to be modified at a great expense to increase this system capacity beyond 2 million gallons.

The Rio De Flag Wastewater Reclamation Plant is limited by the amount of flow that passes in the sewer. The current sewage volume is estimated at 55 per cent of the total average flow (5.42 mgd) or approximately 3 mgd. The distribution system and the plant have the capacity to supply in excess of 4 mgd. Storage may be a limitation depending on the time of day and the amount of individual irrigator storage.

Rural Wastewater

Most of the area outside the city's Urban Growth Boundary is served by on-site sewage disposal systems. Some small community systems including Kachina Village Improvement District and Forest Highlands Water Company provide service to some higher density outlying areas. Generally, the fractured geologic matrix in the area is a poor filtration medium that can impact water quality in wells and surface water. No analysis of the overall capacity of these geologic formations to accommodate septic waste has been completed. Many areas, however, are unsuitable for conventional on-site septic systems, including the Fort Valley area northwest of Flagstaff that has problems with high groundwater, and the Mountainaire Subdivision where there are small lots that do not meet percolation requirements.

Transportation Systems

Flagstaff Area Mobility Trends and Conditions

Projected population growth will bring with it increasing traffic to the Flagstaff area. Daily travel is expected to grow to 3.8 million daily vehicle miles of travel (VMT) by 2020, an 84% increase over 1997. However, population growth will account for only about 65% of the growth in VMT, with the rest attributable to other causes.

First, the average length of local trips has been increasing. This will continue as residential development occurs at locations removed from commercial areas. Second, daily vehicle trips will grow faster than population due to increases in daily travel by visitors and tourists. There will also be increases in through traffic on the state highways, including truck traffic.

Finally, Flagstaff will continue to serve as the primary economic center for a growing north-central Arizona region.

Over 90% of daily person trips in the Flagstaff area utilize private motor vehicles (PMVs). Less than 10% of mobility in the winter is accomplished via public transit, walking and bicycling. In the summer these modes account for only about 12% of daily trips.

However, many larger cities in the mountainous west are working aggressively to reduce “auto dependency” and enable “alternative modes”—transit, walking, bicycling—to account for more than 25% of daily travel in some cases.

Table 5 below provides an estimate of the potential impact of modal shift programs in Flagstaff, including adequate investment in transit and pedestrian and bicycle infrastructure. Supporting transportation demand management programs (e.g., employer transportation coordinator networks) would also be needed.

Table 5. Potential Modal Shifts—Flagstaff Region (by 2020)

Percent of Daily Person Trips	*Summer/Fair*		*Winter/Inclement*	
	Now	*Potential*	*Now*	*Potential*
Pedestrian	10%	15%	8%	14%
Bicycle	2%	6%	1%	2%
Public Transit	< 1%	3%	1%	4%
“Alternative Modes”	12%	24%	10%	20%

Flagstaff Area Mobility Issues and Opportunities

Achieving a Pedestrian-friendly Community.

Citizens involved in the Flagstaff 2020 visioning process placed considerable emphasis on a desire for the greater Flagstaff area to become a pedestrian-oriented place. This was one of the major themes emerging from the vision.

Yet, Flagstaff today does not represent an ideal pedestrian environment for these reasons:

1. Lack of sidewalks.
2. Poor street crossings.
3. Sidewalks are too narrow and too close to the road.

4. Public transit service is minimal.

At the same time, Flagstaff has important assets that could support the development of a walkable city. It is relatively small in scale, with many destinations located within what could be walking range. Finally, the local climate is relatively mild by North American standards with cool summers and cold but sunny winters.

The Flagstaff area would benefit from a concerted effort to become a walkable city. This would improve quality of life for all classes and ages of people. It would reduce congestion by avoiding the unnecessary use of roadway system capacity for short trips. Finally, it would support economic vitality and sustainability.

Capitalizing on the Bicycling Opportunity

A number of university towns in the western US stress bicycling as a mode of travel. In these places, bicycling plays a significant role in daily mobility.

Informal interviews with bicyclists and bike shop employees reveal that the Flagstaff area is regarded as "good" for bicycling because the city is small in scale (many destinations fall within a five-mile radius for many residents) and because a network of "excellent" rural and forest trails is directly accessible from the city without need for recourse to a motor vehicle for transport to a trailhead. However, local bicyclists complain about traffic on the major thoroughfares and about the lack of bike lanes. They also note that local streets are icy much of the winter.

The city has pursued completion of a Flagstaff Urban Trails System (FUTS) since the mid-1980s. This is planned as a citywide network of non-motorized transportation corridors and linear recreation areas. FUTS trails are planned as connections to and between employment centers, activity centers, neighborhoods, schools and parks. The FUTS network includes "primary" and "secondary" segments. The bicycle system plan also includes on-street bike lanes and bike routes.

The Flagstaff area has the potential over the next twenty years to become an environment where bicycling adds significantly to personal mobility for residents, where traffic (at least in fair weather) is reduced by diversion of trips to bicycles and bicycles linked to transit, and where bicycling is a significant recreational attraction for residents and visitors alike. This will require completion of the Flagstaff Urban Trails System and an extensive network of on-street bike lanes connecting living, shopping and employment locations.

Planning a Future Roads and Streets System

Vehicular Transportation System Overview

The Flagstaff area is served by a hierarchy of roadway types, including freeways and arterial, collector, and local streets that provide mobility and access for residents, as shown on the Existing Transportation Network Map. Arterial streets include interstates and major and minor arterials. Freeways include Interstate 17, which provides access to Phoenix and connections to Interstate 10, and Interstate 40, which provides access to Albuquerque, Las Vegas, Los Angeles, and points along the eastern coast of the US.

Major arterials providing inter-regional access include State Highways 89 and 180, and US Highway 89A. Other arterials important to the region include historic Route 66 through the downtown Flagstaff area and points east and west of the city.

The road network is the principal infrastructure for all modes of travel. Transit buses run on the streets mixed with other motor vehicles. Most sidewalks run along streets and are built as part of the street cross section. Bike lanes (often the most direct type of bikeway) are a part of streets, and many FUTS trails run parallel to or along streets.

Roadway System Issues

The process of planning for the future of the Flagstaff area roadway system revolves around three issues:

- How should development respond to increasing congestion?
- What kind of network does the Flagstaff area need?
- What specific roadway projects should be pursued?

These issues are addressed below.

The amount of the Flagstaff area roadway system that is “congested” will increase from only about 8 miles today to over 47 miles by 2020. Motorists using these roads will encounter long queues and significant delays at traffic signals, especially during peak travel times (7:30 to 8:30 AM and 4:00 to 6:00 PM). The most heavily traveled and congested parts of the network will be the state highways through the core area: US 66 east and Milton Road. This will greatly increase the numer of people using I-40 for local trips. The Flagstaff MPO will need to wrestle with the issue of what to do about this congestion. Supply-side approaches—building bigger, wider streets and new roads—bring significant costs and impacts and may not be as beneficial in alleviating congestion as hoped.

In most cases the congestion occurring in a given roadway corridor is caused not by an inadequate number of through lanes, but by the intersections. Wherever signalized intersections exist, the capacity of the roadway to deliver cars to the intersection significantly exceeds the capacity of the intersection itself, since at least some portion of the “green time” must be allocated to the cross street movement.

This phenomenon has caused some cities to adopt a “narrow roads, wide nodes” approach where improvements to intersections (turn lanes, signal optimization) are favored over “add-lanes” projects.

What kind of network does the Flagstaff area need?

Recent research indicates that much of the benefit of a rectilinear grid—which Flagstaff’s terrain prevents--can be achieved by simply requiring better connectivity between subdivisions and between residential areas and commercial areas. The requirement that collectors and connectors be planned and built either by developers or as public/private partnerships can achieve much of the benefits of a grid, while still allowing a curvilinear street layout that conforms well to the landscape. (A connector is a street that does not provide long distance continuity, but does connect adjacent developments.)

An evaluation of the Flagstaff area roadway network reveals two significant characteristics that are affecting traffic distribution and the resulting congestion. First, a well-connected continuous system of streets for north-south movements is lacking. Part of this problem results from discontinuities (missing links) in routes, but part of it relates to a simple lack of north-south collector or arterial routes. The strongest traffic growth is projected for areas south of I-40 with destinations as far north as Route 66. This further underscores these missing north-south links.

Second, the railroad presents a significant barrier to travel within the core of the city. Addressing these two issues and requiring better connectivity in the planning of developments would do much to provide the roadway capacity that the Flagstaff area will need by 2020.

What specific roadway projects should be pursued?

Based on the above discussion of roadway issues, a categorization of projects is presented in Table 6 along with an initial suggestion of overall priority.

Table 6. Types of Roadway Projects

Category	*Project Type*	*Suggested Priority*
Capacity Increase, System Expansion	New roadways	Low
	Add lanes to existing roadways	Low
Network Connectivity, Missing Links	New roadways to eliminate missing links	High
	Grade separations over railroad	High
	Interchanges connecting to new roadways built to eliminate missing links or new grade separations over railroad	High
System Efficiency	Intersection upgrades, new turn lanes	High
	Traffic signal coordination, timing, maintenance	High
	Access management systems	High
	Incident management systems	High
	ITS/Smart highways	Low
Safety	All types	High

Two final issues should be addressed in planning a future roadway system for the Flagstaff area: traffic signal coordination and maintenance and highway access management.

Signals will play a major role in determining the efficiency of the road and street network in moving traffic.

Another aspect of roadway system development is rigorous management of access from adjacent properties. This is most important for collector and arterial roadways and most problematic in commercial areas. The addition of numerous driveways in commercial corridors (and especially in areas that are developing into commercial corridors) has a major impact on the effective throughput capacity of the roadways.

Developing a Transit System

The region's public transit company is Pine Country Transit, which functions as a joint operation of the City of Flagstaff and Coconino County. Pine Country provides service Monday through Friday on three routes from 6:15 AM to 6:30 PM, with limited service on Saturday. Pine Country operates a fleet of six transit vehicles on its normal fixed route system. In addition, Northern Arizona University operates a transit system for intra-campus movement of students, running on a fixed route from 7:30 AM to midnight.

As part of this project, a peer comparison of six other transit systems was prepared to help assess how Flagstaff is doing relative to what similar communities have done. The cities chosen are all western mountain towns with universities. (The full peer review report is available from MPO staff.)

The results are summarized in Table 7 below. As most local observers already realize, Flagstaff has yet to build a significant fixed route transit system.

Table 7. Peer Cities Transit Systems Comparison

	1998 Service Area Population	*Number of Routes*	*Peak Local Headways (minutes)*	*Annual Bus Hours per Capita*	*Peak Fleet (buses)*	*Annual Operations Budget*	*Operations Budget per Capita*	*Annual Ridership per Capita*
Boulder	98,312	27	6	2.22	71	$14.0 M	$143	67
Eugene	236,100	63	30	1.01	73	$14.5 M	$61	28
Flagstaff	63,801	3	60	0.15	3	$0.4 M	$6	2
Fort Collins	95,899	14	30	0.51	16	$2.9 M	$30	17
Logan	32,964	8	30	0.67	8	$0.8 M	$24	26
Missoula	60,930	12	30	0.53	17	$1.7 M	$28	10
Pocatello	53,392	9	60	0.34	8	$0.6 M	$11	4

However, what is less obvious, but clearly shown by the data, is the strong relationship between expenditures and ridership. (One anomaly is Logan, which operates its system as a fare-free service, thus generating a high ridership level per bus hour and per dollar of expense.) Flagstaff's low transit ridership is directly attributable to the low level of service.